Full Name	Class Index No	Class

Anglo-Chinese School (Barker Road)

END-OF-YEAR EXAMINATION 2023
SECONDARY TWO NORMAL (ACADEMIC)

MATHEMATICS
PAPER 1

1 HOUR 30 MINUTES

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your index number and name on all the work you hand in.
Write in dark blue or black pen.

Answer **all** the questions.
If working is needed for any question it must be shown in the space below the question.
Omission of essential working will result in loss of marks.
The use of an approved scientific calculator is expected, where appropriate.
If the degree of accuracy is not specified in the question and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 50.

For Examiner's Use

1 Write the following numbers in order of size, beginning with the smallest.

$$1.3^2 \qquad 1.5 \qquad \sqrt[3]{-6} \qquad \frac{4}{3}$$

Answer _____ (smallest), _____, _____, _____ (largest) [2]

---

2 Write the number 85.898 correct to

(a) 2 decimal places,

Answer _____ [1]

(b) 1 significant figure.

Answer _____ [1]

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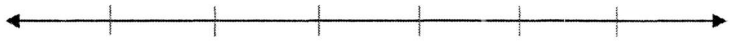
3 **(a)** Solve the inequality $-2x \leq 7$.

Answer _____ [1]

(b) Show your solution from **part (a)** on the number line below.

Answer



[1]

(c) Hence state the smallest prime number which satisfies the inequality $-2x \leq 7$.

Answer _____ [1]

4

E	X	A	M	I	N	A	T	I	O	N

The letters of the word **EXAMINATION** are written on cards.
One card is chosen at random.
Find the probability that the letter on the card is

(a) **S**,

Answer _____ [1]

(b) **A** or **I**.

Answer _____ [1]

---

5 Factorise completely

(a) $24-4a^2$,

Answer _____ [1]

(b) $6d^2-13d-8$.

Answer _____ [2]

---

6 Simplify $5w-4w(3z-1)$.

Answer _____ [2]

---

7 Solve $\frac{5}{2y+3}=\frac{6}{1-y}$.

Answer $y=$ _____ [3]

---

8 **(a)** Construct the triangle PQR where $PQ = QR = 7$ cm and $PR = 5$ cm.

Answer

[2]

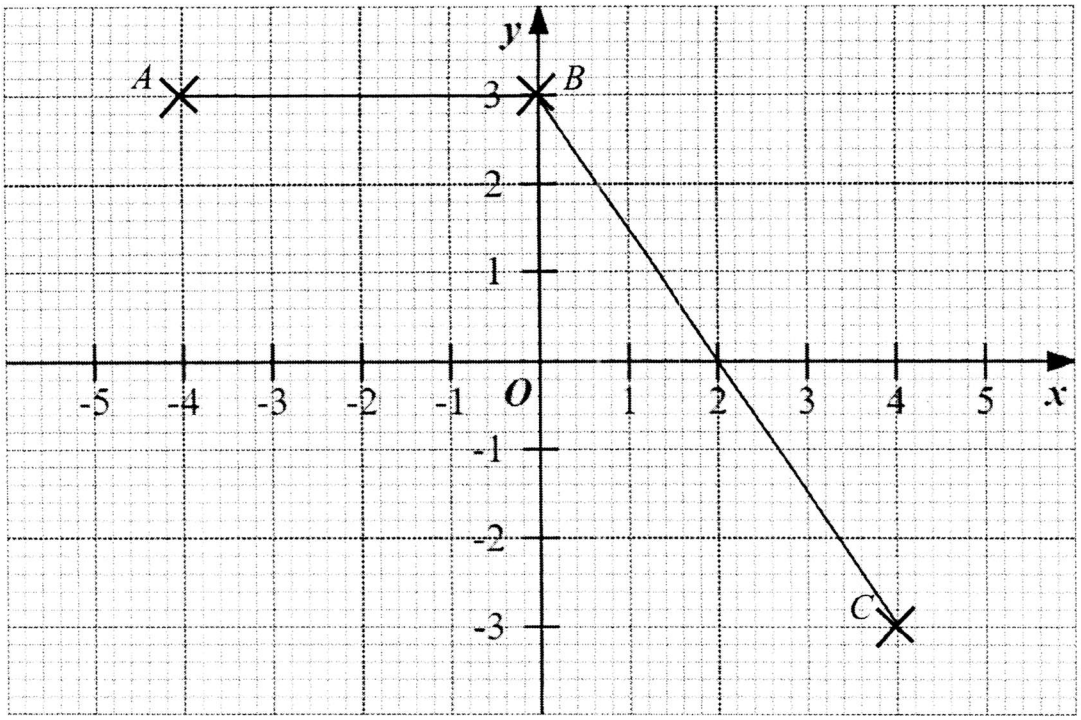
(b) Measure and write down the size of angle QPR.

Answer Angle $QPR =$ _____ ° [1]

(c) Write down the special name given to triangle PQR.

Answer _____ [1]

9



The diagram shows two sides of a parallelogram $ABCD$.
A is the point $(-4, 3)$, B is the point $(0, 3)$ and C is the point $(4, -3)$.

Find

(a) the coordinates of the point D,

Answer (_____, _____) [1]

(b) the gradient of the line BC,

Answer _____ [1]

(c) the equation of the line BC,

Answer _____ [1]

(d) the area of the parallelogram $ABCD$.

Answer _____ unit^2 [2]

10 Simplify

(a) $\dfrac{4x^2}{5y} \times \dfrac{15xy^2}{2z}$,

Answer _____ [2]

(b) $\dfrac{4a^2 - b^2}{6a - 3b}$.

Answer _____ [2]

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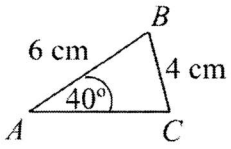
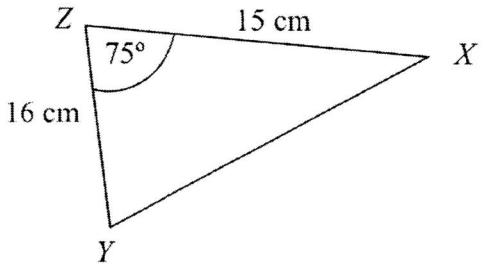
11 Triangles ABC and XYZ are similar.





Find

(a) angle XYZ,

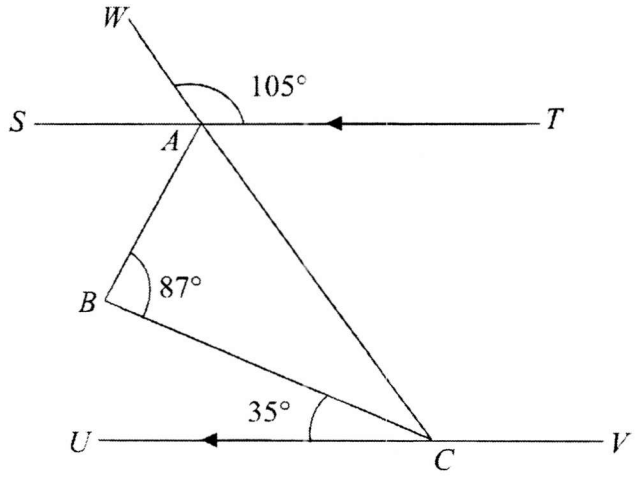
Answer Angle XYZ = _____ ° [2]

(b) the length of XY.

Answer XY = _____ cm [2]

---

12 **(a)**



In the diagram, ST is parallel to UV and WAC is a straight line.
Angle $WAT = 105°$, angle $ABC = 87°$ and angle $BCU = 35°$.

Giving reasons for your answer, find

(i) angle ACB,

Answer Angle $ACB =$ _____ ° [2]

(ii) angle CAB,

Answer Angle $CAB =$ _____ ° [1]

(b) The size of each exterior angle of a regular n-sided polygon is 15°.
Find the value of n.

Answer $n =$ _____ [2]

13 **(a)** y is directly proportional to x^3.
When $x = 2$, $y = 4$.
Find

(i) an equation connecting x and y,

Answer _____ [2]

(ii) the value of y when $x = 6$.

Answer $y =$ _____ [1]

(b) 6 identical pipes can fill a tank completely with water in 18 minutes.

(i) Find the time taken, in minutes, for 4 pipes to fill half of the tank with water.

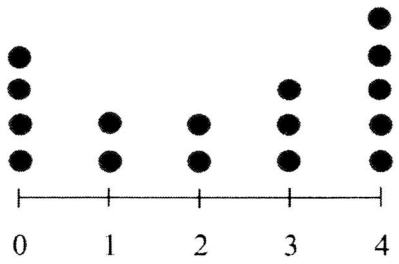
Answer _____ minutes [2]

(ii) State the assumption you have made in **part (b)(i)**.

Answer _____

_____ [1]

14 The dot diagram shows the number of siblings in the families of 16 students.



Find

(a) the median number of siblings,

Answer _____ [1]

(b) the mean number of siblings,

Answer _____ [2]

(c) the probability that a student chosen randomly has at least 2 siblings.

Answer _____ [2]

Full Name	Class Index No	Class

Anglo-Chinese School (Barker Road)

END-OF-YEAR EXAMINATION 2023
SECONDARY TWO NORMAL (ACADEMIC)

MATHEMATICS
PAPER 2

1 HOUR 30 MINUTES

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your index number and name on all the work you hand in.
Write in dark blue or black pen.

Answer **all** the questions.
If working is needed for any question it must be shown in the space below the question.
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If the degree of accuracy is not specified in the question and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 50.

For Examiner's Use

1 Written as the product of its prime factors, $60 = 2^2 \times 3 \times 5$.

(a) Express 84 as the product of its prime factors in index notation.

Answer _____ [1]

(b) Find the smallest positive integer value of k for which $60k$ is a perfect square.

Answer $k =$ _____ [1]

(c) Chocolate bars are sold in packs of 60.
Swiss rolls are sold in packs of 84.
Keith buys the same number of chocolate bars as Swiss rolls.
Find the least number of packs of chocolate bars that he could have bought.

Answer _____ [2]

2 **(a)** Solve the equation $1-\frac{2x-3}{3}=\frac{x}{5}$.

Answer $x =$ _____ [3]

(b) Simplify $\frac{2p-3}{(q-4)^3} \div \frac{8p^2-12p}{(q-4)^2}$, giving your answer as a single fraction.

Answer _____ [3]

3 A lake of 2 km is represented on a map with a length of 10 cm.

(a) Find the scale of the map in the form 1 : n.

Answer 1 : _____ [1]

(b) Find the length of an expressway on the map that represents an actual distance of 1480 m.

Answer _____ cm [2]

(c) Find the actual area of a park, in m^2, that is represented by 0.35 cm^2 on the map.

Answer _____ m^2 [2]

4 A survey was conducted among 50 families to find out the number of times they travelled together as a family in a year. The data collected is shown in the table below.

Number of times travelled	0	1	2	3	4
Number of families	15	a	11	7	b

(a) Show that $a+b=17$.

Answer

[1]

(b) If the mean number of times they travelled as a family is 1.68, show that $a+4b=41$.

Answer

[2]

(c) Solve the simultaneous equations.

$$a + b = 17$$
$$a + 4b = 41$$

Answer $a =$ _____

$b =$ _____ [3]

(d) Find the percentage of families that travelled at most 3 times in the year.

Answer _____ % [2]

5 The table of values below is for the straight line $y = -3 - 2x$.

x	-1	0	1	2
y	p	-3	-5	-7

(a) Find the value of p.

Answer $p =$ _____ [1]

(b) On the grid on **page 9**, draw the line with equation $y = -3 - 2x$. [2]

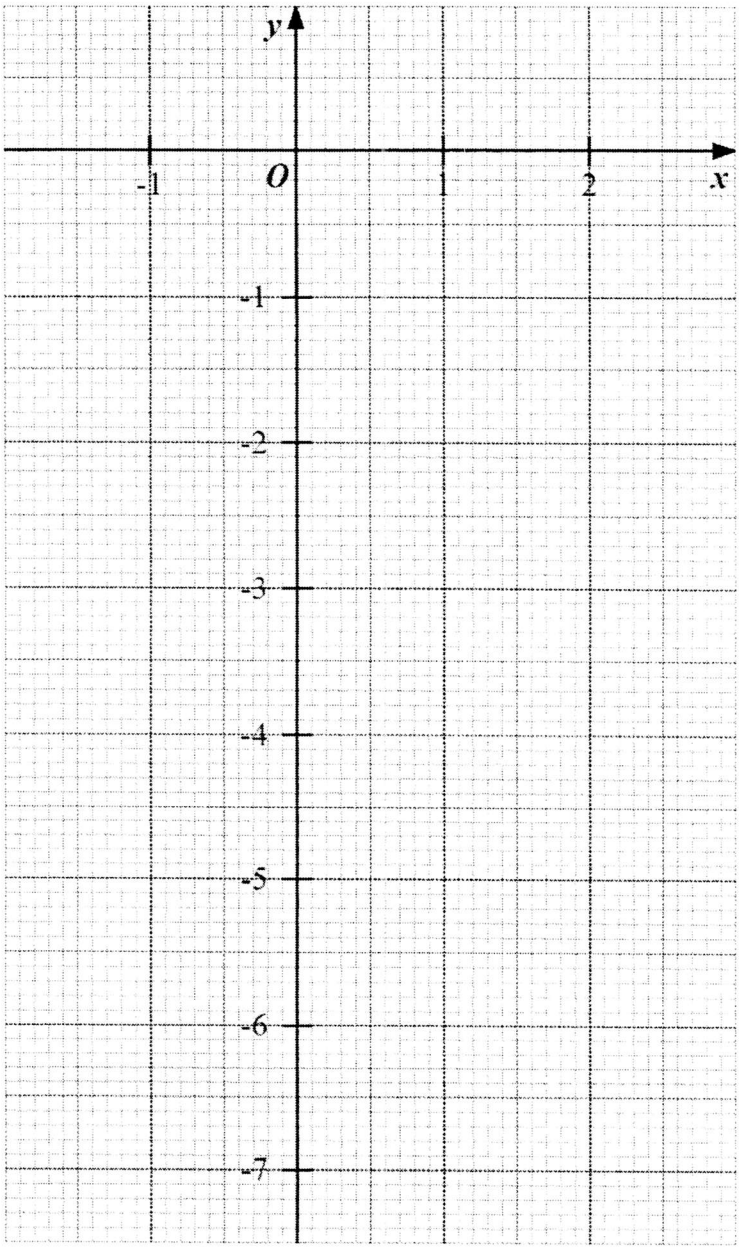
(c) Using your graph, find the value of x when $y = -4.6$.

Answer $x =$ _____ [1]

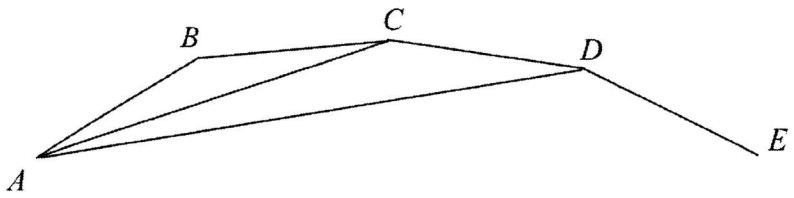
(d) On the same grid, draw and label the line $y = -2$. [1]

(e) Using your graph, write down the coordinates of the point where the line $y = -2$ meets the line $y = -3 - 2x$.

Answer (_____, _____) [1]


y
x
O
-1
1
2
-1
-2
-3
-4
-5
-6
-7

6 The diagram shows part of a regular 18-sided polygon, $ABCDE$ ..... .



Calculate

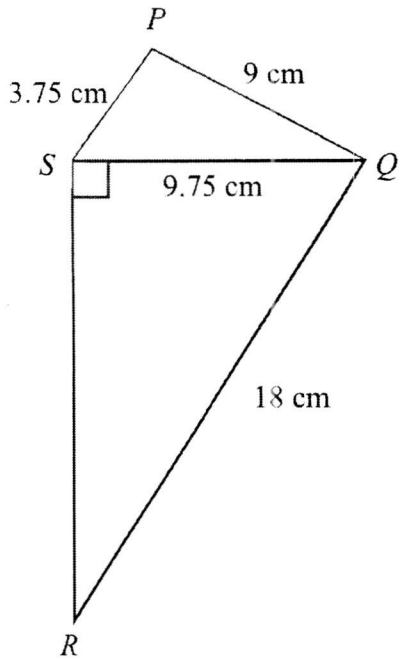
(a) angle ABC,

Answer _____ ° [2]

(b) angle ACD.

Answer _____ ° [2]

7



In the figure $PQRS$, $PS = 3.75$ cm, $PQ = 9$ cm, $QS = 9.75$ cm, $QR = 18$ cm and angle $RSQ = 90°$.

(a) Show that PQS is a right-angled triangle.

Answer

_____

_____

_____ [2]

(b) Find the length of RS.

Answer _____ cm [1]

(c) Find the total area of $PQRS$.

Answer _____ cm^2 [2]

8 The back-to-back stem-and-leaf diagram below shows the number of story books read by children in two daycare centres, Daycare Bliss and Play Hub, in a particular year.

Number of books read by children

Leaf for Daycare Bliss			Stem	Leaf for Play Hub			
9	7	7	0	5	8		
			1	2	2	7	
8 5	3	1	2	1	6	6	8
6	6	3	3	0	8	9	9

Key (Daycare Bliss)
3 | 2 means 23 books

Key (Play Hub)
1 | 2 means 12 books

(a) State the median for Daycare Bliss.

Answer _____ books [1]

(b) State the median for Play Hub.

Answer _____ books [1]

(c) Calculate the percentage of the children who read more than 20 books in Play Hub.

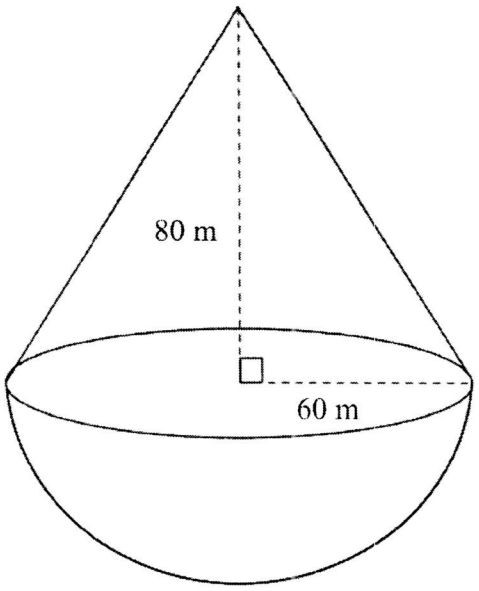
Answer _____ % [2]

(d) State one advantage of using stem-and-leaf diagram in this case.

Answer _____

_____ [1]

9 A new structure shown in the diagram below, has been built. It is made up of hemispherical bottom with radius of 60 m and a right conical top of radius 60 m and height 80 m.



(a) Calculate the volume of the structure.

Answer _____ m^3 [3]

(b) The owner of the structure has been given a budget of \$300 000 to clean up the exterior surface. He is thinking of painting the curved surface of the structure. If he is charged \$ 8.50 per m^2 for the painting, would he have enough budget to proceed with the painting? Show your working and explain clearly.

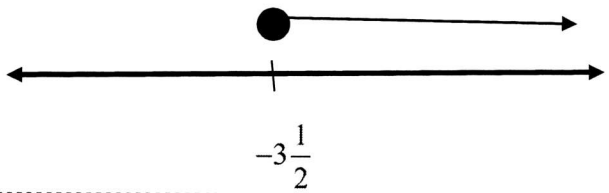
Answer

Yes / No (please circle) because _____

_____ [4]

Anglo-Chinese School
(Barker Road)

Marking Scheme
Secondary 2 Normal (Academic)
Mathematics Paper 1
End-of-Year Examination 2023

1		$\sqrt[3]{-6}, \frac{4}{3}, 1.5, 1.3^2$			
2	(a)	85.90			
	(b)	90			
3	(a)	$x \geq -3\frac{1}{2}$			
	(b)				
	(c)	2			
4	(a)	0			
	(b)	$\frac{4}{11}$			
5	(a)	$4(6-a^2)$			
	(b)	$(2d+1)(3d-8)$			
6		$5w-12wz+4w$			
		$9w-12wz$			

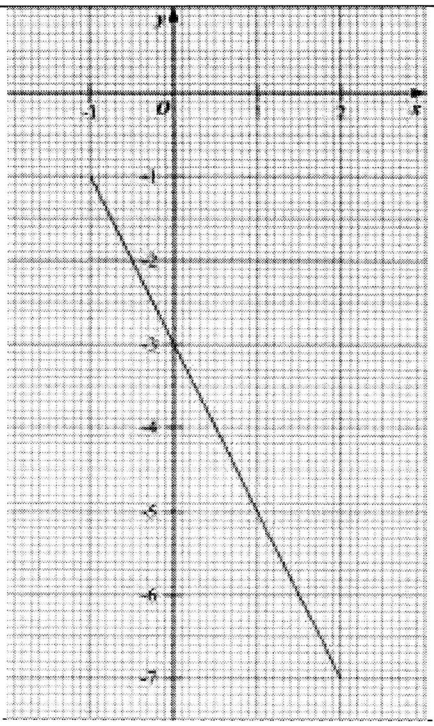
7		$5(1-y)=6(2y+3)$			
		$5-5y=12y+18$			
		$-17y=13$			
		$y=-\frac{13}{17}$			
8	(a)	See attached.			
	(b)	$69\pm1°$			
	(c)	Isosceles triangle			
9	(a)	$(0,-3)$			
	(b)	$-\frac{3}{2}$			
	(c)	$y=-\frac{3}{2}x+3$			
	(d)	6×4			
		24			
10	(a)	$\frac{6x^3y}{z}$			
	(b)	$\frac{(2a-b)(2a+b)}{3(2a-b)}$			
		$\frac{2a+b}{3}$			

11	(a)	$180° - 40° - 75°$			
		$= 65°$			
	(b)	$\frac{XY}{6} = \frac{YZ}{BC} = \frac{16}{4}$ $XY = \frac{16}{4} \times 6$			
		$= 24$ cm			
12	(ai)	angle $TAC = 180° - 105° = 75°$ (adj. angle on a str. line)			
		angle ACU = angle TAC (alt. angles, ST // UV)			
		$75° - 35°$			
		$= 40°$			
	(aii)	$180° - 87 - 40°$ (angle sum of triangle)			
		$= 53°$			
	(b)	$\frac{360°}{15}$			
		$= 24°$			
13	(ai)	$4 = k(2)^3$			
		$k = \frac{1}{2}$			
		$y = \frac{x^3}{2}$			
	(aii)	108			
	(bi)	$\frac{(6 \times 18)}{4} = 27$			
		$\frac{27}{2}$			
		13.5			
	(bii)	The filling rate of pipe is constant.			

14	(a)	2.5			
	(b)	$\frac{0\times4+1\times2+2\times2+3\times3+4\times5}{16}$			
		2.1875 (exact value)			
	(c)	$\frac{10}{16}$			
		$=\frac{5}{8}$			

u1	(a)	$2^2 \times 3 \times 7$			
	(b)	15			
	(c)	LCM $= 2^2 \times 3 \times 5 \times 7$			
		$= 420$			
		$420 \div 60$			
		$=7$			
2	(a)	$15-5(2x-3)=3x$			
		$15-10x+15=3x$			
		$13x=30$			
		$x=2\frac{4}{13}$			
	(b)	$\frac{2p-3}{(q-4)^3} \times \frac{(q-4)^2}{8p^2-12p}$			
		$\frac{2p-3}{(q-4)^3} \times \frac{(q-4)^2}{4p(2p-3)}$			
		$\frac{1}{4p(q-4)}$ or $\frac{1}{4pq-16p}$			
3	(a)	1 cm : 0.2 km = 1 : 20 000			
		20 000			
	(b)	$10 \times \frac{1.48}{2}$			
		$= 7.4$			
	(c)	100 cm^2 ☹ 4 km^2			
		0.35 cm^2 ☹ $4 \times \frac{0.35}{100}$			
		$= 0.014$ km^2			
		$= 14\,000$ m^2			

4	(a)	$15+a+11+7+b=50$			
		$a+b=17$ (shown)			
	(b)	$mean=\frac{0\times15+a+2\times11+3\times7+4b}{50}$			
		$1.68=\frac{a+22+21+4b}{50}$			
		$84=a+4b+43$			
		$a+4b=41$ (shown)			
	(c)	Using elimination method or substitution method			
		correctly.			
		$a=9$			
		$b=8$			
	(d)	$\frac{15+9+11+7}{50}\times100\%$			
		$\frac{42}{50}\times100\%$			
		84%			
5	(a)	-1			

	(b)				
	(c)	0.8 (range 0.7 — 0.9 accepted)			
	(d)	Correct line with label			
	(e)	$(-0.5,-2)$			
6	(a)	$\frac{(18-2)\times 180}{18}$ or $\frac{360}{18}=20$; $180-20$			
		$=160$			
	(bi)	$160-\frac{(180-160)}{2}$			
		$=150$			
7	(a)	$PQ^2 + PS^2 = 9^2 + 3.75^2 = 95.0625$			
		$QS^2 = 9.75^2 = 95.0625$			
		Since $PQ^2+PS^2 = QS^2$, by the converse of Pythagoras' Theorem, PQS is a right-angled triangle.			

	(b)	$\sqrt{18^2-9.75^2}=15.131$			
		15.1 or 15.13 or 15.131			
	(c)	$\frac{3.75\times 9}{2}+\frac{9.75\times 15.131}{2}$			
		$=90.638625$			
		$=90.6$			
8	(a)	Median $=\frac{23+25}{2}=24$			
	(b)	26			
	(c)	Percentage of students $=\frac{8}{13}\times 100\%$ $=61.5\%$ (to 3s.f) or $61\frac{7}{13}\%$			
	(d)	The original values are retained/it shows the shape of the distribution/ it can highlight clusters, gaps and outliers./ present 2 sets of data at the same time./ exact value seen/ easier to see the number of books read/ easier to compare the values between the 2 centres.			
9	(a)	Volume of the cone $\frac{1}{3}\times\pi\times(60)^2\times 80$ 301592.8947 Volume of hemisphere $\frac{1}{2}\times\frac{4}{3}\times\pi\times(60)^3$ 452389.3421 753982.2369 $=754000\ m^3$			
	(b)	Slanted height of cone $=\sqrt{60^2+80^2}=100m$			

		Total surface area = $\pi \times 60 \times 100 + 2 \times \pi \times (60)^2$			
		= 41469 m^2/ 41469.02303 m^2			
		$41469 \times \$8.50$ $41469.02303 \times \$8.50$ = \$352 486.50 or = \$352 486.70			
		No, the painting is over the budget by \$52486.50 / \$52486.70			